ENVIRONMENTAL PARTNERS INC

Final Report

Don Oline Autofluff Site
2120 Marine View Drive
Tacoma, Washington

Prepared For:

Hylebos Marina
1940 Marine View Drive
Tacoma, Washington

June 11, 1998

Prepared By:

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Project Manager

Project Number: 18601.0

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1.0 INTRODUCTION

This Final Report has been prepared to document the remediation of the Don Oline Autofluff Site located at 2120 Marine View Drive in Tacoma, Washington (site). The site location is presented on Figure 1. This remediation was performed pursuant to a Consent Decree between the Washington Department of Ecology (Ecology) and the potential responsible parties (PRPs) at the site. The PRPs at the site include Mr. Donald E. Oline, Mr. Ronald S. Oline, and Ms. Judy D. Johnson. The PRPs entered into the Consent Decree in fulfillment of their obligations as a PRP on the nearshore and upland remediation of the Hylebos Waterway being conducted by Ecology.

The Consent Decree became final on July 30, 1997. Site remediation progressed through the fall of 1997 and winter of 1997/1998. On March 2, 1998 The Ecology Project Manager, Mr. Russ McMillen, notified the PRPs that the completed remediation and site restoration met with Ecology approval and had been performed in accordance with the requirements of the Consent Decree.

site restoration (upland fill and regrading and intertidal placement of clean material) was in compliance with the Consent Decree and that Ecology would review the final report to determine suitability of remedial actions.

1.1 Background

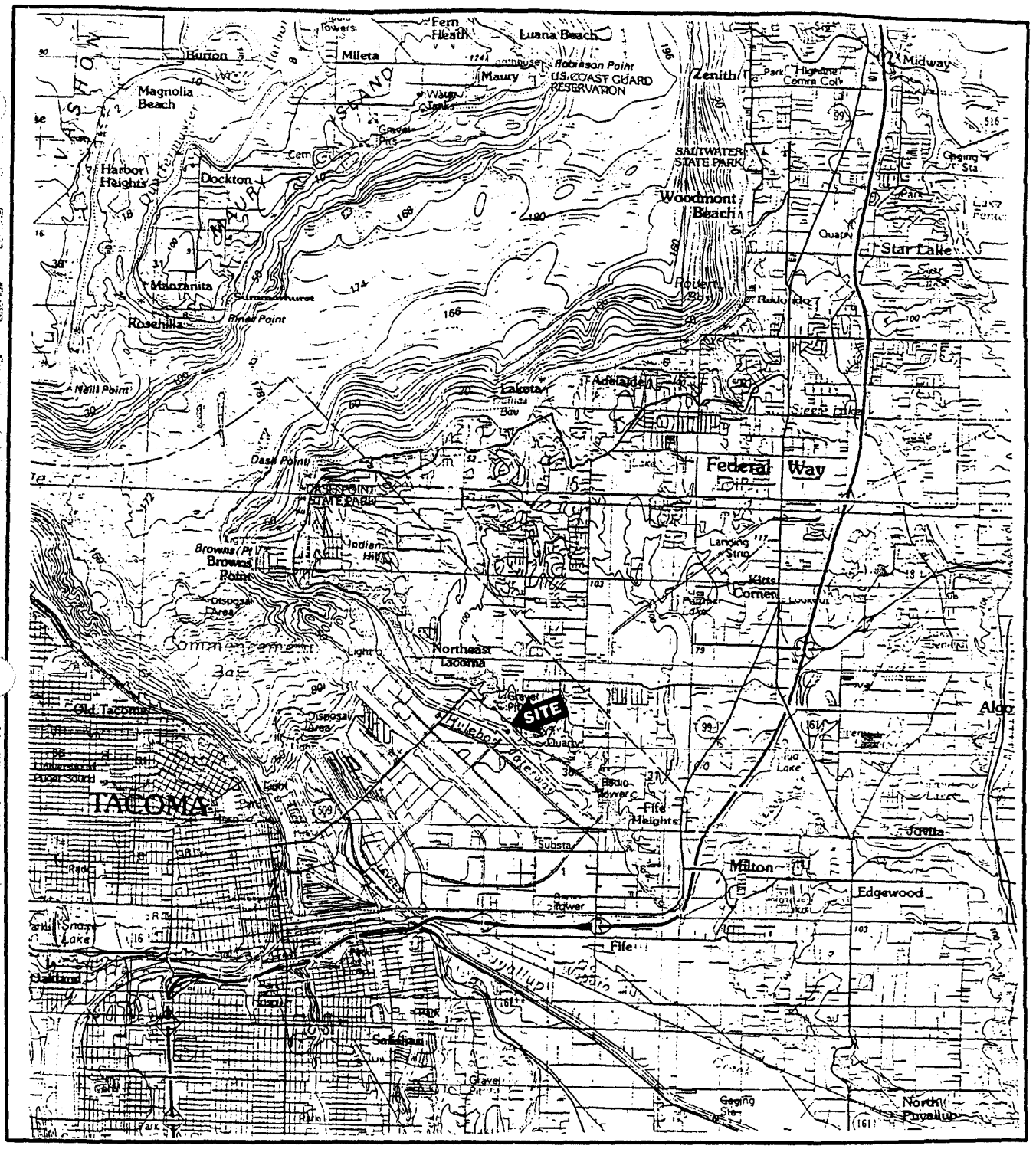
The site was purchased by Mr. Don Oline in 1972. Autoshredder residue (ASR; a.k.a., autofluff) consists of shredded non-recyclable automobile components from the General Metals of Tacoma, Inc. (General Metals) facility on Marine View Drive. The ASR was reportedly placed as backfill material at the site behind two bulkheads along the Hylebos Waterway. The site was subsequently covered with gravel and has been used since that time for storage of miscellaneous machinery and equipment.

In November 1994 EMCON Northwest, Inc. (EMCON) performed an investigation of the site on behalf of General Metals. This investigation indicated the presence of an estimated 1,230 cubic yards of ASR in the upland portion of the site and about 90 cubic yards of ASR within the intertidal zone. ASR in the uplands portion of the site was estimated to be up to 6 feet deep and less than 1 foot thick in the intertidal zone.

Hylebos Clean-up Committee

During characterization sampling of Hylebos Waterway sediments by Ecology in 1996, two intertidal sediment samples near the site were observed to contain concentrations of several compounds above the sediment quality objectives (SQOs) for the Hylebos Waterway. These compounds included polychlorinated biphenyls (PCBs), several polycyclic aromatic hydrocarbons (PAHs), several phthalates, and several metals. Ecology established cleanup levels for seventeen individual contaminants of concern (COC) within the intertidal portion of the site and for four COCs in the upland portion of the site.

The results of the Ecology sediment sampling and the findings of the EMCON site investigation were used as the basis for the technical approach and scope of work presented in the Consent Decree and Compliance Monitoring Plan (CMP) prepared for the site remediation.



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Date: May 1998
Project No.: 18601.0

Figure 1
General Vicinity Map
Don Oline Autofluff Site
2120 Marine View Drive
Tacoma, WA

Scale: 1:100,000

Source: USGS 30x60 Minute Quadrangle (Topographic)

Tacoma, Washington 1991

1.2 Report Organization

The remaining sections of this report are organized as follows:

- Section 2.0 presents the objectives of the remedial efforts at the site.
- Section 3.0 presents the technical approach used in fulfilling the objectives and the performance criteria stipulated in the consent decree for the site remediation.
- Section 4.0 presents the findings of the site remediation.
- Section 5.0 presents the conclusions supported by the findings of the site remediation.

The attached appendices (under separate cover) contain back-up documentation including hardcopy analytical data sheets and available bills-of-lading, and tipping receipts for material disposal.

2.0 OBJECTIVES

The general objective of the site remediation was to achieve the specified cleanup levels for the site COCs throughout both the upland and intertidal portions of the site.

The specific objectives of the site remediation were to:

- Remove all ASR from the upland and intertidal portions of the site.
- Attain the Ecology-specified cleanup levels for COCs in the intertidal portion of the property (See Section 3.1 below).
- Attain Model Toxics Control Act (MTCA; WAC 173-340) Method A Industrial soil cleanup levels for COCs in the upland portion of the site.
- Restore habitat in the intertidal portions of the site.
- Restore the site to a usable condition consistent with the current port-industrial zoning.

3.0 TECHNICAL APPROACH

The following sections describe the technical approach used to attain the project objectives. This technical approach was approved in the Work Plan, the CMP, and in subsequent discussions with Mr. McMillen.

3.1 Intertidal Sediments

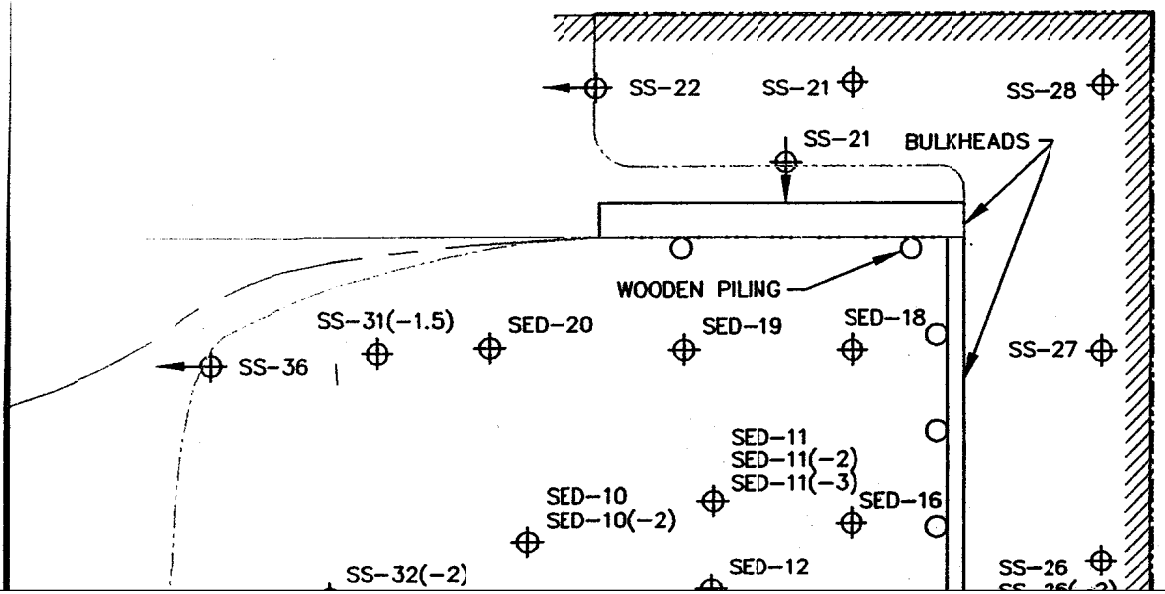
The intertidal portion of the site is defined as the area between 0.0 feet mean low low water (MLLW) and 20 feet shoreward of the MLLW+12.0 feet shoreline. The bulkheads at the site generally defined the location of the MLLW+12.0 feet shoreline. Therefore, the intertidal portion of the site, in effect, extended from MLLW to 20 feet shoreward of the outboard edge of the bulkheads. The intertidal portion of the site is indicated on Figure 2.

The Consent Decree mandated that specific cleanup levels be attained for 17 individual COCs throughout the intertidal area of the site. The cleanup levels are based on the Hylebos Waterway Sediment Quality Objectives (SQOs) established in the Commencement Bay/Nearshore Tideflats Record of Decision and have been applied to the site under WAC 173-340-710. These intertidal COCs and the stipulated cleanup levels for the site are listed in Table 1.

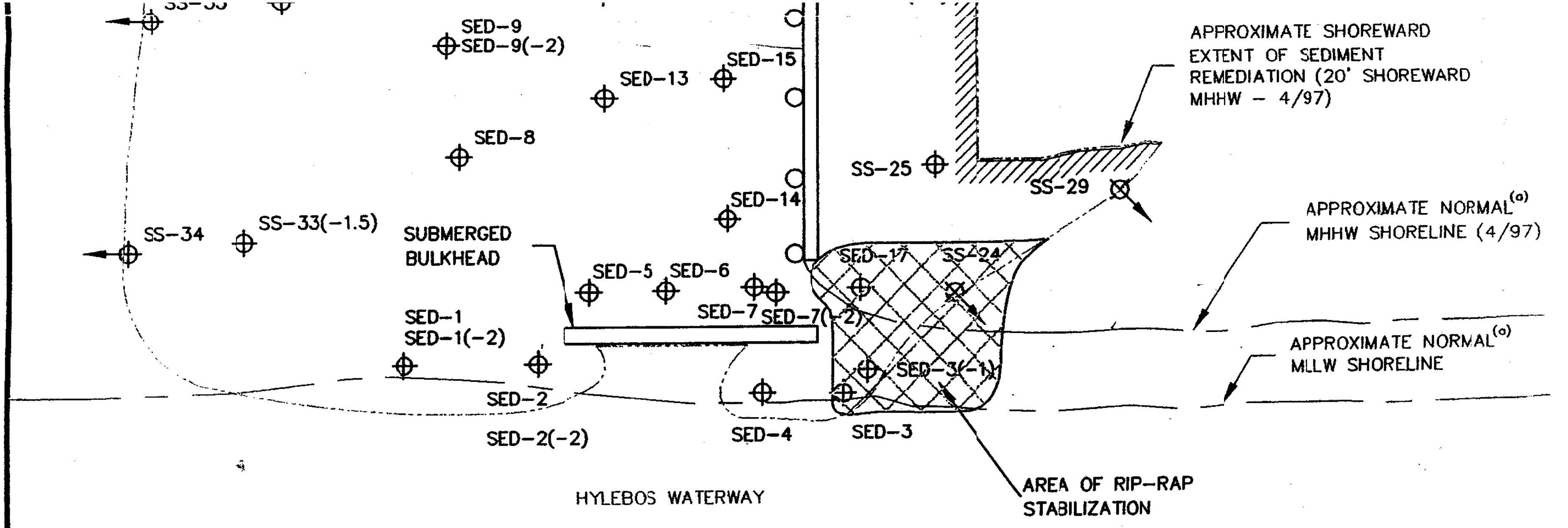
	Dist NW of Bulkhead	Dist SW of Bulkhead
SS-36	27½'	13'
SED 15	10'	47½'
14	10	65'

20 10 0 20

SCALE: 1" = 20'



Stake in shore edge @ 43
Sample taken 42'-12'
+10' out



DL for some phthalates > criteria

(a) PRIOR TO ANY SITE EXCAVATION/REMEDIATION

LEGEND

SED-1	SEDIMENT-BOTTOM SAMPLE
SS-26(-2)	SEDIMENT-BOTTOM SAMPLE WITH DEPTH BELOW ASR-SEDIMENT CONTACT
SS-32	SEDIMENT-EDGE OF EXCAVATION SAMPLE
‐ ‐ ‐ ‐ ‐	LIMIT OF INTERTIDAL REMEDIAL EXCAVATION
— – —	APPROXIMATE MHHW & MLLW SHORELINE (AS LABELED)

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FIGURE 2

LIMIT OF INTERTIDAL REMEDIAL EXCAVATION AND PERFORMANCE SAMPLING LOCATIONS

#	M/D/Y	EXPLANATION
REV.	DATE	DESCRIPTION

DATE

PROJECT	18601.0 DON OLINE AUTOFLUFF SITE
PREPARED FOR	HYLEBOS MARINA
LOCATION	2120 MARINE VIEW DRIVE TACOMA, WASHINGTON

SHEET	DRAWN BY	REVIEWED BY	DATE DRAWN
1 of 1	LKL	TCM	11/17/97

Table 1
Intertidal Sediment COCs and Specified Cleanup Levels

Contaminant of Concern	Acronym	Cleanup Level
PAHs		**(µg/kg)**
Acenaphthene	--	500
Fluoranthene	--	2,500
Fluorene	--	540
Phenanthrene	--	1,500
Phthalates		**(µg/kg)**
Bis-(2-ethylhexyl) phthalate	BEHP	1,300
Butylbenzylphthalate	BBP	900
Dimethylphthalate	DMP	160
Di-n-butylphthalate	DnBP	1,400
Other Semivolatile Compounds		**(µg/kg)**
N-nitrosodiphenylamine	N-NDP	28(a), 100(b)
Dibenzofuran	DBF	540
Total PCBs	--	**300 µg/kg**
Metals		**(mg/kg)**
Cadmium	Cd	5.1
Copper	Cu	390
Lead	Pb	450
Mercury	Hg	0.59
Nickel	Ni	140
Zinc	Zn	410

(a) – Target cleanup level is below the practical quantification limit of the required analytical method.
(b) – Actual level used based on practical quantification limit

The technical approach used to attain the cleanup levels for the specified COCs involved direct excavation throughout the intertidal portion of the site. The minimum goal of excavation was to remove all visible ASR and the upper six inches of underlying soil material. Samples of the underlying material were then collected and submitted for laboratory analysis to evaluate the need for additional excavation and sampling (See Section 3.3 Performance Sampling and Analysis).

Intertidal excavation was performed only during low tide when an area to be excavated was above water. Excavation during low tide resulted in better control over the extent of the excavation and resulted in less turbidity within the Hylebos Waterway and less potential re-mobilization of COCs from the ASR exposed during excavation.

During low tide a small track-mounted excavator was either driven, or lowered, onto the intertidal sediments. The excavator placed ASR and sediment into a 3 cubic yard skiff that was lifted off of the intertidal zone using a hydraulic boom crane. Where possible a larger excavator sitting on the upland

was used. Both excavators used a bladed bucket to minimize scarification of the underlying tidal sediments, thereby reducing turbidity during tidal ebb and flow.

The limits of the intertidal excavation are indicated on Figure 2. During excavation in the intertidal zone, ASR was observed at a maximum depth of about 3 feet below the original intertidal surface beneath the central portion of the east-west trending bulkhead. This required that the east-west bulkhead be removed to complete the site remediation.

ASR was also observed in the bank sediments south of the west end of the east-west trending bulkhead. This required the excavation of a near-vertical section of shoreline. Excavation of this material was not contemplated during preparation of the Consent Decree and the CMP. Restoration of this area is discussed in detail in Section 3.4.

Excavated material was initially stockpiled in the upland on areas with confirmed ASR in the subsurface. Excavated material was placed into three open-bottomed steel bins and allowed to gravity de-water into the subsurface. The steel bins were 16 feet square and 4 feet tall. After removal of about 300 cubic yards of intertidal ASR and sediment it was confirmed that the materials did not release large amounts of free water. It was therefore decided that the bins were not necessary to contain de-watering liquids. The intertidal ASR and sediment were then placed directly onto the upland ASR for dewatering. The dewatering was sufficiently slow that puddles did not form at the surface and all dewatering liquids infiltrated into the subsurface.

A total of 474.88 tons of intertidal ASR and sediment was transported to Hidden Valley Landfill in Puyallup, Washington on the authorization of Mr. Norman LeMay of LeMay Enterprises, Inc. A summary of tipping slips is presented in Appendix B. Table 2 summarizes loads and volumes of intertidal ASR and sediment transported to Hidden Valley Landfill.

Table 2
Summary of Intertidal ASR and Sediment Disposal

Landfill Acceptance Date	Load	Tonnage
August 27, 1997	1	22.14
	2	19.31
	3	21.86
	4	18.96
	5	23.81
	6	20.64
	7	20.40
	8	22.79
Subtotal		**169.91**
August 28, 1997	1	22.79
	2	18.57
	3	15.27
	4	19.65
	5	21.29
	6	22.40
	7	21.81
	8	18.54
	9	21.93
	10	20.47
	11	24.70
	12	19.99
	13	12.59
	14	18.64
	15	26.33
Subtotal		**304.97**
Total Tonnage		**474.88**

3.2 Upland Soils

The upland portion of the site is defined as the area between 20 feet landward of the MLLW +12 feet shoreline and the upland property line. The upland portion of the site is indicated on Figure 3.

The Consent Decree mandated that MTCA Method A Industrial soil cleanup levels be attained for four COCs throughout the upland portion of the site. These upland COCs and specified cleanup levels are listed below in Table 3.

Table 3
Upland Soil COCs and Specified Cleanup Levels

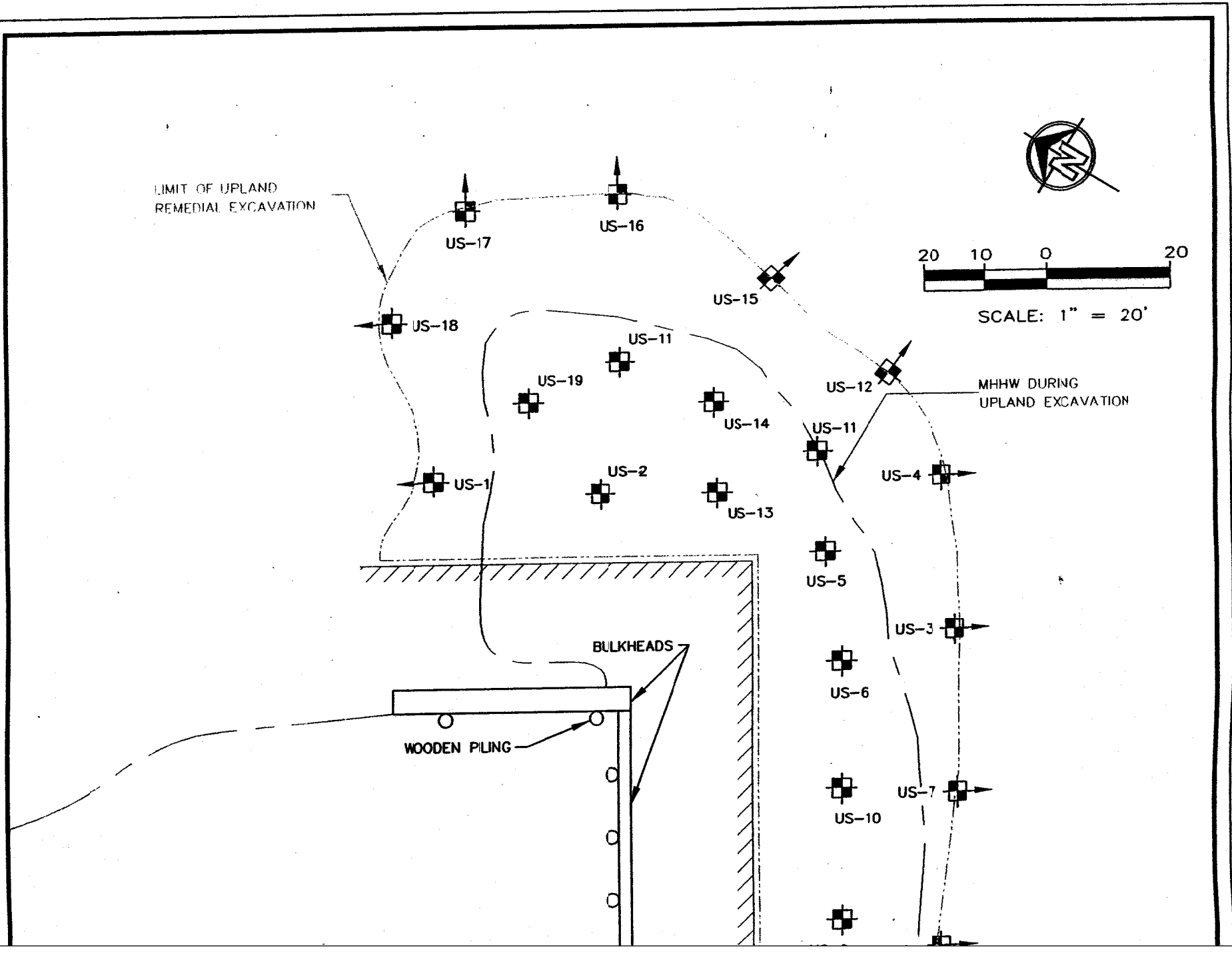
Contaminant of Concern	Acronym	Cleanup Level (mg/kg)
Total PCBs	--	10.0
Cadmium	Cd	10.0
Lead	Pb	1,000
Mercury	Hg	1.0

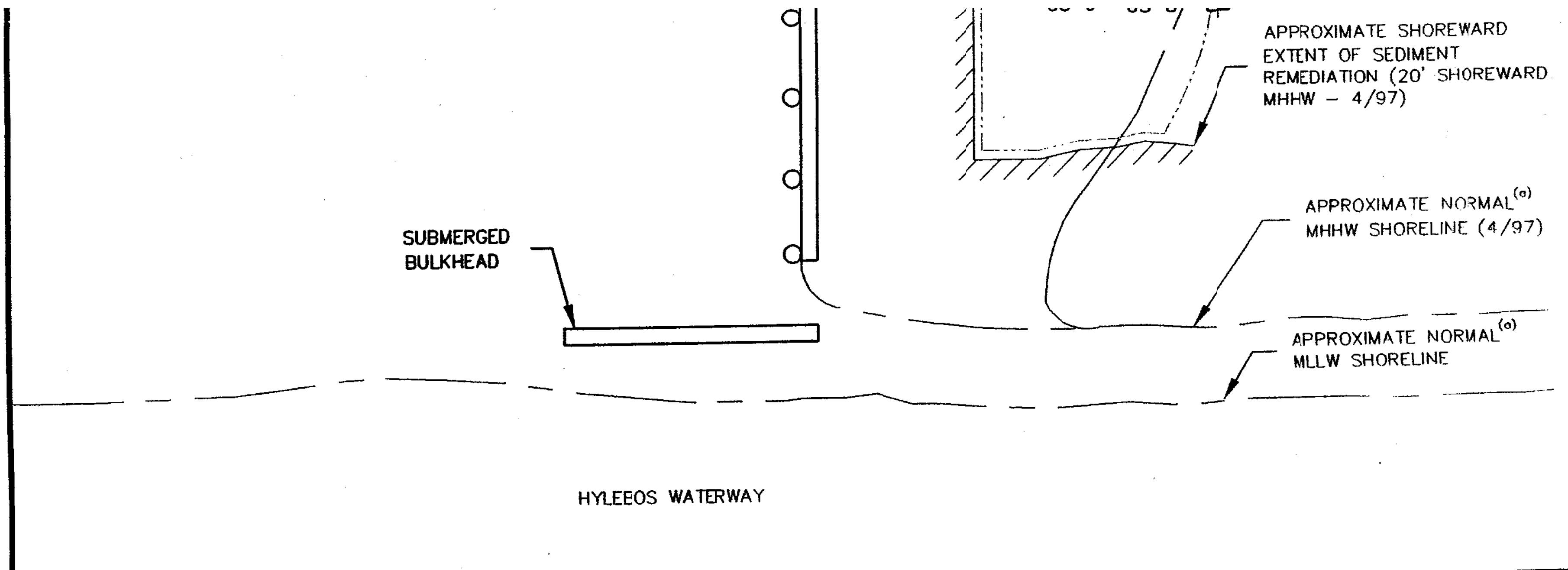
As in the intertidal zone, the technical approach used to attain these cleanup levels involved complete excavation of all ASR and underlying soils that contained concentrations of upland COCs exceeding the required cleanup levels.

About 1.0 feet of gravel overlying the ASR in the upland was scraped from the surface and stockpiled on-site for future use as backfill. This stockpile was about 200 cubic yards. Confirmational sampling of this material is documented below in Section 3.3.

After the surface gravel was excavated, a track-mounted excavator was used to remove ASR and contaminated soil in the site upland. The limits of upland ASR and soil excavation are indicated on Figure 3. The excavated material was stockpiled on areas of in-place ASR and allowed to gravity dewater. Dewatering was sufficiently slow that it did not result in the formation of puddles at the surface and all dewatering liquids infiltrated into the subsurface. Once ASR excavation had progressed to a point where there was no longer an area of in-place ASR for stockpiling excavated ASR, the excavated materials were loaded directly into 25 ton containers for transport to the Rabanco Tacoma intermodal facility. The containers where then weighed and loaded onto railcars for transport to the Rabanco Regional Landfill in Roosevelt, Washington.

A total of 1085.23 tons of upland ASR and contaminated soil was transported to the Rabanco Regional landfill. Copies of landfill bills-of-lading and tipping receipts are presented in Appendix B. Table 4 summarizes the loads and volumes of upland ASR and soil transported to Rabanco.


LIMIT OF UPLAND
REMEDIAL EXCAVATION
US-17
US-16
US-15
US-18
US-11
US-19
US-12
MHHW DURING
UPLAND EXCAVATION
US-14
US-11
US-1
US-2
US-4
US-13
US-5
US-3
BULKHEADS
US-6
WOODEN PILING
US-7
US-10
20 10 0 20
SCALE: 1" = 20'



(a) PRIOR TO ANY SITE EXCAVATION/REMEDIATION

LEGEND

- US-9 UPLAND SOIL-BOTTOM SAMPLE
- US-1 UPLAND SOIL-EDGE OF EXCAVATION SAMPLE
- LIMIT OF UPLAND REMEDIAL EXCAVATION
- APPROXIMATE MHHW & MLLW SHORELINE (AS LABELED)

#	M/D/Y	EXPLANATION
REV.	DATE	DESCRIPTION

DATE

ENVIRONMENTAL PARTNERS INC
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BELLEVUE, WASHINGTON 98004
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FAX 425-889-4755

FIGURE 3
LIMIT OF UPLAND REMEDIAL EXCAVATION AND PERFORMANCE SAMPLING LOCATIONS

PROJECT	18601.0 DON OLINE AUTOFLUFF SITE
PREPARED FOR	HYLEBOS MARINA
LOCATION	2120 MARINE VIEW DRIVE TACOMA, WASHINGTON

SHEET	DRAWN BY	REVIEWED BY	DATE DRAWN
1 of 1	LKL	TCM	11/17/97

Table 4
Summary of Upland ASR and Soil Disposal

Landfill Acceptance Date	Load	Tonnage
October 16, 1997	1	20.06
	2	28.90
	3	29.93
	4	24.10
	5	25.95
	6	24.31
	7	25.03
	8	22.11
	9	24.06
	10	22.65
	11	22.48
	12	28.46
	13	28.51
	14	19.40
	15	20.42
	16	19.92
	17	24.49
	18	20.24
	19	25.78
	20	25.14
Subtotal		**490.94**
October 22, 1997	1	35.63
	2	35.81
	3	32.01
	4	33.21
Subtotal		**136.66**
October 23, 1997	1	33.19
	2	31.90
	3	30.73
Subtotal		**95.82**
October 24, 1997	1	34.20
	2	32.09
	3	31.61
	4	35.22
	5	35.46
Subtotal		**168.58**
October 25, 1998	1	35.05
	2	28.98
	3	29.52
Subtotal		**93.55**
November 1, 1997	1	32.10
	2	35.86
Subtotal		**67.96**
November 4, 1997	1	31.72
Total Tonnage		**1085.23**

3.3 Performance Sampling and Analysis

As stated above, performance sampling and analysis were used to confirm compliance with cleanup levels after all visible ASR had been removed from an area.

Due to the large number of analytes and analyses required to establish compliance with intertidal cleanup levels, two levels of performance sampling were established - screening analyses and final performance analyses. Screening analyses used the following abbreviated list of seven intertidal COCs to make an initial determination of compliance:

- Cadmium
- Lead
- Mercury
- Zinc
- Total PCBs
- Bis-(2 ethylhexyl) phthalate
- Butylbenzylphthalate

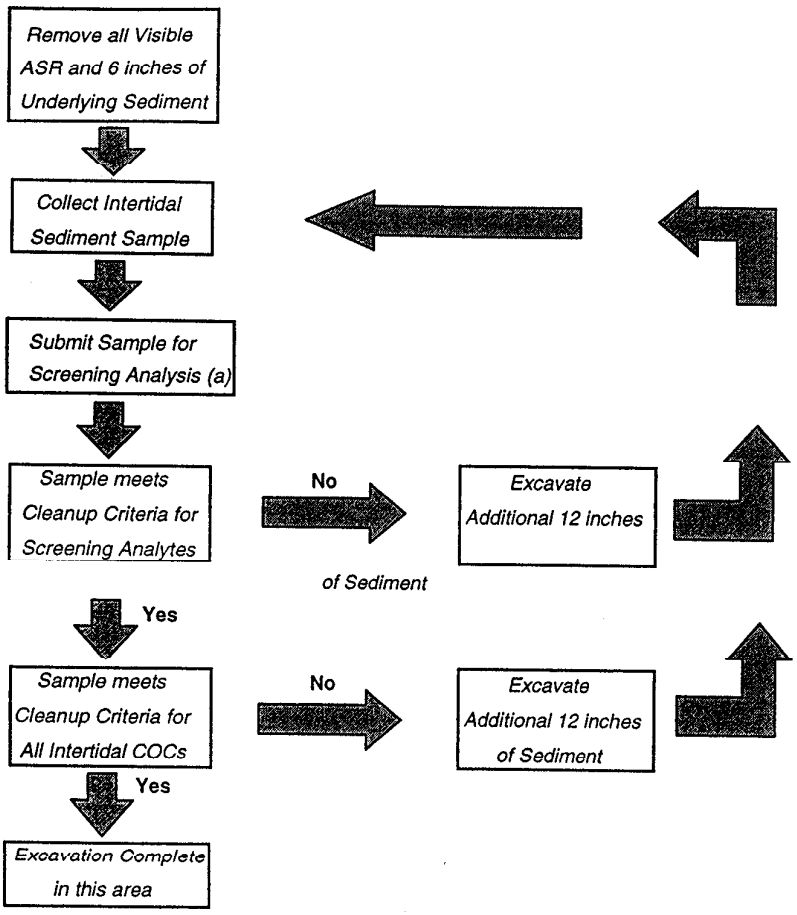
If a sample failed to meet the intertidal cleanup levels for the screening analyses, an additional 1-foot of sediment was removed from about a 20 foot by 20 foot area surrounding the sample that failed to comply with the cleanup levels for the screening analytes. The area was resampled and again submitted for the screening analyses.

If the analytical results for the screening analyses attained intertidal cleanup levels then the sample was submitted for the full list of intertidal COCs. If that sample failed to meet intertidal cleanup levels for one of the compounds in the full COC analyte list, an additional one foot of sediment was removed from about a 20 foot by 20 foot area surrounding the sample that failed to comply with the cleanup levels for the full intertidal COC list. The area was then resampled to establish compliance.

Figure 4 illustrates the decision tree for intertidal sampling and analyses.

Screening analyses were performed on an accelerated turnaround basis (i.e., 1 to 5 days) depending upon the field schedule for excavation. Analyses for the full list of intertidal COCs for final performance monitoring was performed under standard laboratory turnaround times.

FIGURE 4
Decision Tree for
Intertidal Sediment Excavation
and Performance Sampling



(a) – This step is skipped if screening analysis were previously performed.

The full list of intertidal COCs contained all 17 of the compounds listed in Table 1. Table 5 lists the analytical methods used for each of the intertidal COCs during both the screening analyses and the final performance monitoring analyses.

Table 5
Summary of Analytical Methods and Method Detection Limits for Intertidal Sediment Sample Analyses

Contaminant of Concern	Extraction Method	Analytical Method	Detection Limit [a]	Sed CL Level
PAHs				
Acenaphthene	EPA 3540	EPA 8270	0.100 mg/kg	.500
Fluoranthene	EPA 3540	EPA 8270	0.100 mg/kg	2.500
Fluorene	EPA 3540	EPA 8270	0.100 mg/kg	.540
Phenanthrene	EPA 3540	EPA 8270	0.100 mg/kg	1.500
Phthalates				
Bis-(2-ethylhexyl) phthalate	EPA 3540	EPA 8270	1.00 mg/kg	1.3
Butylbenzylphthalate	EPA 3540	EPA 8270	0.500 mg/kg	.9
Dimethylphthalate	EPA 3540	EPA 8270	0.100 mg/kg	.160
Di-n-butylphthalate	EPA 3540	EPA 8270	0.200 mg/kg	1.4
Other Semivolatile Compounds				
N-nitrosodiphenylamine	EPA 3540	EPA 8270	0.100 mg/kg	SQL .028 mg/kg
Dibenzofuran	EPA 3540	EPA 8270	0.100 mg/kg	.540
Total PCBs	EPA 3540	EPA 8081	0.050 mg/kg	.300
Metals				
Cadmium	EPA 3050	EPA 6010A	0.050 mg/kg	5.1
Copper	EPA 3050	EPA 6010A	0.300 mg/kg	390
Lead	EPA 3050	EPA 6010A	2.00 mg/kg	450
Mercury	BrCl Digestion	EPA 7471A	0.010 mg/kg	0.59
Nickel	EPA 3050	EPA 6010A	0.300 mg/kg	140
Zinc	EPA 3050	EPA 6010A	0.200 mg/kg	410

(a) – Method Detection Limits may vary with each sample due to matrix interferences or dilutions necessary to keep detected compounds within the instrument range. The detection limits listed were the lowest levels attainable by North Creek. Full analytical laboratory QA/QC documentation is presented in Appendix A.

In order to comply with Puget Sound Dredge Disposal Act (PSDDA) analytical requirements for intertidal sediment analyses, three intertidal performance samples were submitted for analysis of "sediment conventionals." These analyses included the following:

- Total Solids
- Total Organic Carbon
- Total Volatile Solids
- Total Sulfide
- Ammonia
- Particles Size Analysis

Due to the small number of upland COCs, screening analyses were not required during the performance sampling. All upland soil samples were submitted for analysis of each of the upland COCs listed in Table 3. Table 6 lists the analytical methods used for performance monitoring analyses of upland soils.

Table 6
Summary of Analytical Methods and Method Detection Limits for Upland Soil Sample Performance Analyses

Contaminant of Concern	Extraction Method	Analytical Method	Detection Limit (a)
Total PCBs	EPA 3540	EPA 8081	0.050 mg/kg
Cadmium	EPA 3050	EPA 6010A	0.250 mg/kg
Lead	EPA 3050	EPA 6010A	10.0 mg/kg
Mercury	BrCl Digestion	EPA 7471A	0.050 mg/kg

(a) – Method Detection Limits may vary with each sample due to matrix interferences or dilutions necessary to keep detected compounds within the instrument range. The detection limits listed were the lowest levels attainable by North Creek. Full analytical laboratory QA/QC documentation is presented in Appendix A.

Sample analyses for both intertidal sediment and upland soil performance samples were performed by North Creek Analytical Laboratories, Inc. (North Creek) in Bothell, Washington. North Creek is certified under PSDDA to perform analyses on marine sediment and soils.

Performance monitoring samples were collected from representative areas of the intertidal and upland areas and in all cases meet the minimum sampling requirements specified by Ecology in the CMP. At the time of collection each sample location was marked with a wooden stake and labeled with the sample name. This was performed to facilitate future reference to that location in the event additional excavation and sampling were required based on laboratory analyses.

Each sediment and upland soil sample was collected using a stainless steel spoon and a stainless steel mixing bowl. The spoon was used to collect the upper six inches of material from a particular location. Samples were placed in the mixing bowl and homogenized prior to being placed in glass jars. Sampling spoons and bowls were decontaminated between uses by a thorough washing and scrubbing with a non-phosphate soap and rinsing with de-ionized water.

Sample containers were supplied by North Creek. All sample containers were either 16-ounce or 32 ounce wide-mouth glass jars and sealed with polytetrafluorothylene (PTFE) lined screw lids. Each sample container was immediately labeled and placed in an iced cooler pending submittal to North Creek. All samples were handled using standard chain-of-custody procedures. Laboratory QA/QC procedures and frequency were based on the Superfund sample delivery group protocol.

3.4 Site Restoration

3.4.1 Intertidal Zone

Intertidal zone restoration was performed only after all ASR and contaminated soils from the intertidal zone and upland had been removed and laboratory analysis indicated that all performance samples met the required cleanup levels.

During the intertidal excavation it was necessary to remove the east-west trending bulkhead and a portion of the intertidal bank soils south of the west end of this bulkhead.

A new bulkhead consisting of pre-cast concrete piling and hollow-core sections was rebuilt prior to placement of any backfill material. Technically, the bulkheads at the site establish the high tide line but the intertidal zone is defined as extending to 20 feet landward of the high tide line. During site restoration, the area landward of the bulkheads was backfilled using the same techniques employed during the upland site restoration. These techniques are discussed below in section 3.4.2.

After construction of the bulkhead and upland backfilling (see below) a large excavator was used to cast a 3/8-inch minus (i.e., all particles smaller than 3/8 inch) "fish mix" material into the intertidal zone. The fish mix was approved by Ecology and the Department of Fisheries for establishing aquatic habitat. The fish mix was placed from at least the 0.0 MLLW line and throughout the intertidal area to establish a grade similar to the grade that existed prior to excavation. The material was initially spread with the machinery and final grading was performed by hand using landscaping tools.

Fish & Wildlife

Rip-rap was placed at the northern edge of the north-south trending bulkhead to stabilize the slope in this area. The rip-rap extends to about a 10 foot radius from the end of the bulkhead.

A slope resembling the pre-existing bank was re-established in the area south of the western end of the east-west bulkhead using rip-rap boulders. This area is indicated on Figure 2. These boulders were then covered with smaller boulders and cobbles and the interstitial voids were filled with fish mix. This provided a stable slope and habitat generally consistent with the pre-excavation conditions. This new slope was constructed with Ecology and Department of Fisheries input and the final construction was inspected and approved by Ecology.

3.4.2 Upland

Upland site restoration was necessarily performed prior to intertidal restoration in order to provide access by machinery to the intertidal zone.

The upland was backfilled with a Class B backfill material. The 200 cubic yards of previously stockpiled surface gravel was also used as backfill. Backfill was placed by progressively building outward from the landward edges of the upland excavation and extended to the landward sides of the bulkheads. This material was placed from the base of the excavation to within about 12 inches of the final grade using end-dump trucks, a tire-mounted payloader and a track-mounted bulldozer. The backfill was compacted by track-rolling.

The upper 12 inches of the site was backfilled with an aggregate baserock consisting entirely of 3/8-inch and larger angular gravel. This material was compacted with a vibratory roller. Placing this surface material greatly limits the potential for surface run-off from the site.

4.0 FINDINGS

4.1 Intertidal Sediments

Intertidal sediment performance samples were collected from a total of 36 individual sampling locations. Intertidal sediment samples were designated with either an "SED" or a "SS" prefix. Figure 2 indicates sampling locations and depth below the initial ASR/sediment interface. The results of intertidal sediment performance samples are summarized in Table 7. The results of sediment conventionals analysis are summarized in Tables 8 and 9. Laboratory analytical reports including PSDDA Level I quality assurance/quality control (QA/QC) reports are presented in Appendix A.

All final performance samples met all of the intertidal cleanup levels for the full list of intertidal COCs. However, in selected samples, the cleanup level for a particular compound may exceed the method detection level for that compound. This occurred in all cases for N-NDP and in selected instances for BEHP, DnBP, and DMP.

The cleanup level stipulated by Ecology for N-NDP (i.e., 28 micrograms/kilogram) was well below the practical quantification limit (PQL) of 100 micrograms/kilogram achievable by North Creek. The stipulated cleanup level for BEHP was also below the PQL in samples SED-14, SED-15, SS-21 and SS-22. The stipulated cleanup level for DnBP and DMP was below the PQL in samples SED-14 and SED-15. DnBP was detected in only one sample, and the detected concentration was below the cleanup level. Neither DMP nor N-NDP were detected in any samples at any concentration. North Creek reported that the elevated detection limits were the result of high matrix interferences from naturally occurring organic compounds and that lower detection limits were not attainable. Ecology was made aware of this situation early in the project.

4.2 Upland Soils

Upland soil performance samples were collected from a total of 19 individual sampling locations. Upland soil samples were designated with a "US" prefix. Figure 3 indicates upland soil performance sampling locations. The results of laboratory analyses for upland soil samples are summarized in Table 10. Laboratory analytical reports including QA/QC data are presented in Appendix A.

All final performance sample analytical results were below the MTCA Method A Industrial soil cleanup levels for each of the upland soil COCs.

Four soil samples were collected from the gravels removed from the surface of the site and stockpiled for use during site restoration. Each of these samples was a three component composite. Laboratory analyses of these samples indicated that the concentrations of COCs present were below the MTCA Method A Industrial soil cleanup levels. These stockpiled soils were re-used during backfilling in the upland area of the site (see Section 3.4).

5.0 CONCLUSIONS

The following conclusions are supported by the findings of this report:

- The intertidal sediment remediation at the site has complied to the fullest extent possible with the stipulations of the Consent Decree. The intertidal sediment cleanup levels have been attained throughout the intertidal portion of the site as demonstrated by the results of the intertidal sediment performance sampling.

- The upland soil remediation at the site has complied to the fullest extent possible with the stipulations of the Consent Decree. The MTCA Method A Industrial soil cleanup levels have been attained throughout the upland portion of the site as demonstrated by the results of the upland soil performance sampling.

- Site restoration has been completed in accordance with the Consent Decree. The site has undergone a final inspection and has been accepted by Ecology.

Table 7
Summary of Sediment Performance Sample Analytical Results
Don Oline Autofluff Site
EPI No. 18601.0

Sample	Depth(a) (ft)	Status Removed	Status Final	Metals (mg/kg) Cd	Cu	Pb	Ni	Zn	Hg	Total PCBs (µg/kg)	Semivolatiles (µg/kg) BEHP	BBP	DnBP	DMP	N-NDP	Polycyclic Aromatic Hydrocarbons (µg/kg) Ace-naphthene	Flour-anthene	Fluorene	Phen-anthrene	Dibenzo-Furan (µg/kg)
SED-1	0.0	X		<0.25	55.6	30.7	10.2	137	0.057	**303**	**2,640**	642	na	na	na	na	na	na	na	na
SED-1	2.0		X	<0.25	7.83	<10	6.04	19.5	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-2	0.0	X		<0.25	29.4	13.3	6.99	73.6	<0.05	227	609	151	<500	<100	<100	<100	218	<100	179	<100
SED-2	2.0		X	<0.25	7.21	<10	3.25	13.5	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-3	0.0	X		<0.25	11.7	<10	3.73	34.3	<0.05	**320**	<500	154	<500	<100	<200	<100	<100	<100	<100	<100
SED-3	1.0		X	na	6.45	na	4.92	14.5	na	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-4	0.0		X	<0.25	6.98	<10	<1.5	27.7	<0.05	215	<500	221	<500	<100	<100	<100	<100	<100	<100	<100
SED-5	0.0		X	<0.25	32.6	23.1	13.5	60.8	<0.05	144	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-6	0.0		X	<0.25	33.2	<10	10.8	56.7	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-7	0.0	X		<0.25	39.7	16.7	11.7	75.2	<0.05	107	**6,600**	237	<500	<100	<100	<100	128	<100	171	<100
SED-7	2.0		X	na	57	na	13	150	na	51.1	<500	163	<500	<100	<100	<100	<100	<100	145	<100
SED-8	0.0		X	<0.25	36.5	<10	10.8	44.9	<0.05	<50	<1000	<200	<1000	<100	<100	<200	295	<200	356	<200
SED-9	0.0	X		<0.25	38.5	44.5	25.5	110	0.0547	<50	<2500	<500	<2500	<100	<100	<500	**14,700**	**666**	**6,880**	<500
SED-9	2.0		X	<0.25	35.7	12.6	14.3	44.9	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-10	0.0	X		<0.25	36.3	32.8	25.1	149	<0.05	**375**	1250	**1,090**	<1000	<100	<100	<200	<200	<200	<200	<200
SED-10	2.0		X	na	15	na	26.3	37.7	na	67.1	<500	<100	<500	<100	<100	<100	588	<100	181	<100
SED-11	0.0	X		3.34	152	159	28.7	**867**	<0.05	**953**	**2,800**	**1,720**	<2500	<100	<100	<500	702	<500	<500	<500
SED-11	2.0	X		na	63.2	na	30	168	na	**831**	<500	<100	<500	<100	<100	<100	2080	<100	531	<100
SED-11	3.0		X	<0.25	38.3	13.9	15.4	42.8	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SED-12	0.0		X	<0.25	55.3	48	18.3	179	<0.05	<50	<1000	<200	<1000	<100	<100	<200	288	<200	<200	<200
SED-13	0.0		X	0.552	91	110	48.2	298	0.118	184	<1000	<200	<1000	<100	<100	<200	795	<200	<200	<200
SED-14	0.0		X	<0.25	44.3	37.1	13.3	61.3	<0.05	<50	<2500	<500	<2500	<500	<500	<500	1270	<500	1250	<500
SED-15	0.0		X	<0.25	51.7	43.3	16	74.6	<0.05	<50	<2500	<500	<2500	<500	<500	<500	1000	<500	871	<500
SED-16	0.0		X	<0.25	35.4	11.2	13.4	36.4	<0.05	<50	<500	<100	<500	<100	<100	<100	115	<100	138	<100
SED-17	0.0		X	<0.25	47.9	<10	21.5	49.8	<0.05	81.7	930	145	<500	<100	<100	<100	<100	<100	<100	<100
SED-18	0.0		X	<0.25	32.9	<10	13.5	38.6	<0.05	<50	<500	<100	<500	<100	<100	<100	998	<100	489	<100
SED-19	0.0		X	<0.25	36.1	13.8	14.9	39.1	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
Cleanup Level		na		5.1	390	450	140	410	0.59	300	1,300	900	1,400	160	23	500	2,500	540	1,500	540

2

(a) - depth in feet below visible ASR
Cd - Cadmium, **Cu** - Copper, **Pb** - Lead, **Ni** - Nickel, **Zn** - Zinc, **Hg** - Mercury
PCB - Polychlorinated Biphenyls
BEHP - Bis (2ethylhexyl) phthalate
BBP - Butylbenzyl phthalate
DnBP - Di-r-butylphthalate
DMP - Dimethyl Phthalate
N-NDP - N-Nitrosodiphenylamine
Bold numbers indicate detected concentrations exceeding cleanup levels established in the consent decree for the site.
All sample analyses were performed consistent with the requirments of the Puget Sound Dredge Disposal Act (PSDDA) analytical protocols.

Non-detects > Cleanup Level

Table 7 Cont.
Summary of Sediment Performance Sample Analytical Results
Don Oline Autofluff Site
EPI No. 18601.0

Sample	Depth(a) (ft)	Status		Metals (mg/kg)						Total PCBs (µg/kg)	Semivolatiles (µg/kg)					Polycyclic Aromatic Hydrocarbons (µg/kg)				Dibenzo-Furar (µg/kg)
		Removed	Final	Cd	Cu	Pb	Ni	Zn	Hg		BEHP	BBP	DnBP	DMP	N-NDP	Ace-naphthene	Flour-anthene	Fluorene	Phen-anthrene	
SED-20	0.0		X	<0.25	15	<10	27.1	35.6	<0.05	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-21	0.0		X	0.107	23.3	91.6	15.3	49	<0.010	55.7	<2500	<500	<500	<100	<100	<100	<100	<100	<100	<100
SS-22	0.0		X	0.508	36.2	36.3	15.8	178	0.0216	117	<2500	<500	680	<100	<100	<100	186	<100	<100	<100
SS-23	0.0		X	0.247	10.2	<2	33.8	207	0.013	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-24	0.0		X	<0.250	34.7	24.6	14.0	85.3	<0.010	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-25	0.0		X	<0.250	36.2	<10	19.0	37.7	<0.010	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-26	0.0	X		<0.250	51.5	38.7	16.9	66.0	0.0297	102	**2,390**	<200	<500	<100	<100	<100	602	<100	272	<100
SS-26	2.0		X	na	na	na	na	na	na	na	<500	<100	<500	<100	<100	<100	1,330	<100	111	<100
SS-27	0.0		X	<0.250	16.0	16.2	21.2	38.2	<0.010	58.7	553	308	<500	<100	<100	<100	<100	<100	<100	<100
SS-28	0.0		X	<0.250	21.3	<10	11.3	23.9	<0.010	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-29	0.0		X	0.849	24.2	<10	17.1	46.3	<0.010	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-31	0.0	X		2.23	203	263	25.9	**630**	<0.010	**618**	<10,000	**2,540**	<5,000	<1,000	<1,000	<1,000	1,590	<1,000	<1,000	<1,000
SS-31	1.5		X	<0.250	20.6	10.3	27.9	53.3	<0.05	<50	<500	119	<500	<100	<100	<100	<100	<100	<100	<100
SS-32	0.0	X		<0.250	155	132	21.5	131	0.0182	**329**	**1,810**	716	<5,000	<1,000	<1,000	<100	<1,000	<100	<1,000	<100
SS-32	2.0		X	<0.250	15.5	<10	31.9	36.1	<0.050	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-33	0.0	X		0.363	72.9	56.1	22.5	222	0.0235	179	**4,240**	**1,620**	<5,000	<100	<1000	<100	<1,000	<100	<1,000	<100
SS-33	1.5		X	<0.250	29.1	<10	12.3	34.6	<0.050	<50	<500	<100	<500	<100	<100	<100	142	<100	203	<100
SS-34	0.0		X	<0.250	28.7	<10	11.1	33.6	<0.050	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-35	0.0		X	<0.250	15.2	<10	30.5	33.7	<0.050	<50	<500	<100	<500	<100	<100	<100	<100	<100	<100	<100
SS-36	0.0		X	<0.250	38.7	39.1	22.4	117	<0.050	246	<1000	<200	<1000	<200	<200	<200	356	<200	<200	<200
Cleanup Level		na		5.1	390	450	140	410	0.59	300	1,300	900	1,400	160	28	500	2,500	540	1,500	540

(a) - depth in feet below visible ASR
Cd - Cadmium, **Cu** - Copper, **Pb** - Lead, **Ni** - Nickel, **Zn** - Zinc, **Hg** - Mercury
PCB - Polychlorinated Biphenyls
BEHP - Bis (2ethylhexyl) phthalate
BBP - Butylbenzyl phthalate
DnBP - Di-n-butylphthalate
DMP - Dimethyl Phthalate
N-NDP - N-Nitrosodiphenylamine
Bold numbers indicate detected concentrations exceeding cleanup levels established in the consent decree for the site.
All sample analyses were performed consistent with the requirments of the Puget Sound Dredge Disposal Act (PSDDA) analytical protocols.
No sample number SS-30 was collected

Table 8
Summary of Sediment Conventionals Analytical Results
Don Oline Autofluff Site
EPI No. 18601.0

Sample	Ammonia-Nitrogen (a) (mg/l)	Total Solids Solids (a) (% by weight)	Total Sulfide (a) (mg/kg dry)	Total Volatile Solids (a) (% by weight)	Total Organic Carbon (b) (% by weight dry)
SED-2 (2')	ND	NA	ND	0.60	0.0237
SED-7 (2')	4.46	68.4	ND	1.70	0.479
SED-19	36.9	66.3	5.57	3.20	1.76

(a) parameters by PSEP recommended guidelines
(b) parameters by PSEP TOC recommended guidelines
ND- denotes Not Detected at or above the reporting limit
NA - denotes Not Analyzed

Table 9
Summary of Particle Size Analysis Results [a]
Don Oline Autofluff Site
EPI No. 18601.0

Sample Designation	% passing by weight														
	# 4	#10	#20	#40	#60	#140	#200	#230	phi 4	phi 5	phi 6	phi 7	phi 8	phi 9	phi 10
SED-2 (2')	100	99.5	93.0	49.5	16.9	2.30	1.80	1.70	ND	ND	ND	ND	ND	ND	ND
SED-7 (2')	100	99.9	99.3	98.6	97.9	97.4	97.0	96.6	95.0	91.4	70.3	63.3	54.5	33.4	19.3
SED-19	100	100	99.9	99.6	99.4	99.0	98.6	98.3	85.9	73.1	56.7	45.7	34.7	20.1	9.10
	% retained by weight														
SED-2 (2')	ND	0.50	6.50	43.5	32.6	14.6	0.50	0.10	1.70	ND	ND	ND	ND	ND	ND
SED-7 (2')	ND	0.10	0.60	0.70	0.70	0.60	0.40	0.40	1.70	3.50	21.1	7.00	8.80	21.1	14.1
SED-19	ND	ND	0.10	0.30	0.20	0.40	0.30	0.30	12.4	12.8	16.5	11.0	11.0	14.6	11.0

(a) grain size by PSEP recommended guidelines
ND- denotes Not Detected at or above the reporting limit

Table 10
Summary of Upland Soil Performance Sample Analytical Results
Don Oline Autofluff Site
EPI No. 18601.0
(mg/kg)

Sample	Cadmium	Lead	Mercury	Total PCBs
US-1	<0.250	14.8	<0.05	<0.050
US-2	<0.250	10.4	<0.05	0.198
US-3	0.879	89.9	0.17	1.674
US-4	<0.250	34.4	0.0588	0.0527
US-5	0.87	96.1	0.151	0.165
US-6	<0.250	18.3	0.0943	0.0818
US-7	0.674	66.8	0.275	<0.5
US-8	<0.250	48.3	<0.05	<0.050
US-9	<0.25	114	0.19	0.361
US-10	<0.25	27.2	<0.05	0.427
US-11	0.313	13.1	0.0884	0.145
US-12	<0.25	<10	<0.05	<0.050
US-13	<0.25	<10	<0.05	<0.050
US-14	<0.25	<10	<0.05	0.173
US-15	8.57	491	0.221	4.27
US-16	1.54	111	0.0616	0.281
US-17	2.95	148	0.2	2.083
US-18	4.61	601	<0.05	<0.150
US-19	3.18	165	0.0926	2.540
CF-1(a)	<0.25	32.5	0.0746	0.862
CF-2(a)	0.434	326	0.177	0.415
CF-3(a)	<0.25	41.8	0.146	<0.5
CF-4(a)	4.3	244	0.143	0.965
MTCA Method A Industrial Cleanup Level (b)	10.0 Residential 2.0	1,000 250	1.0 1.0	10.0 1.0

(a) Samples collected from gravel used for backfill in uplands. This gravel was removed from above the upland ASH prior to excavation.
(b) Model Toxics Control Act; WAC 173-340-745 Table 3.
Bold - indicates concentration exceeds MTCA Method A Industrial Cleanup Levels